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Notice of Allowability

Application No.

10/695,209

Examiner

Jaworski Francis J.

Applicant(s)

STEEN, ERIK NORMANN

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Interview 9/24/07; amdt 5/24/07.
2. ☒ The allowed claim(s) is/are 1 - 6, 8 - 16, 25 - 29, 31 - 34.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.


Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____


Francis J. Jaworski
Primary Examiner

EXAMINER'S AMENDMENT

An extension of time under 37 CFR 1.136(a) is required in order to make an examiner's amendment which places this application in condition for allowance. During a telephone conversation conducted on 9/24/07, Evan Sotiriou, Reg. No. 46,247 requested an extension of time for TWO MONTH(S) and authorized the Director to charge Deposit Account No. 07-0845 the required fee of \$450.00 for this extension and for any fee for the additional new claim and authorized the following examiner's amendment. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows, after entry of the Rule 116 Amendment filed on May 24, 2007:

Claim 1 has been deleted in favor of:

-- 1. (currently amended) A medical imaging system comprising:

an image sensor receiving imaging signals from a region of interest defining an image volume;

a memory coupled to the image sensor, the memory storing image data derived from the imaging signals, where the image data comprise:

first image data for a first sub-region of the region of interest defining an image sub-volume and acquired during and synchronized to a first occurrence of a physiologic cycle;
[[and]]

second image data for a second sub-region of the region of interest defining an image sub-volume and acquired during and synchronized to a second occurrence of the physiologic cycle; and

a processor coupled to the memory for initiating display of the first image data while the second image data is being acquired, and for initiating display of the first image data joined with the second image data after the second image data is acquired based on the physiologic synchronization to form a larger overall image encompassing the image volume while other sub-volumes are being acquired. --

Claim 7 has been cancelled.

Claims 17 – 24 have been cancelled.

Claim 25 line 1, dependency has been changed from “17” to -- 1 --.

Claim 26 has been deleted in favor of

-- 26. (currently amended) A method for medical imaging, the method comprising the steps of:

receiving at an image sensor imaging signals from a region of interest defining an image volume;

storing in a memory image data derived from the imaging signals, including:

first image data for a first sub-region of the region of interest defining an image sub-volume and acquired during and synchronized to a first occurrence of a physiologic cycle; and

second image data for a second sub-region of the region of interest defining an image sub-volume and acquired during and synchronized to a second occurrence of the physiologic cycle;

initiating display of the first image data while the second image data is being acquired; and

initiating display of the first image data joined with the second image data after the second image data is acquired based on the physiologic synchronization and while other sub-volumes are being acquired, the first image data and second image data defining a larger image than the first image data and encompassing the image volume. --

supplementing the first image data with third image data for the first sub-region of the region of interest acquired during a third occurrence of the physiologic cycle.

Claim 30 has been cancelled.

Claim 34 has been added as:

-- 34. (new) The medical imaging system of claim 1, where the first image data comprises a first series of first sub-region images and the second image data comprises a second series of second sub-region images. --

The following is an examiner's statement of reasons for allowance:

Newman (US6544175) is directed to two modes of subvolume ultrasound imaging:

1) A non-realtime/playback/cineloop/breath-holding mode as stated col. 6 lines 54 - 58 in which each subvolume is collected in timed synchronization to a phase of the heartbeat while artifact motion (respiration and allied body movement) is suspended to eliminate that contaminant, and then playback represents a full volume image albeit a non-realtime one. One may presume that the interleave that results represents all of the subvolumes for the duration of at least one heart cycle. Alternately stated, this

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means that if a prior art imager had a line acquisition rate to support continual infeed of say $1/N$ the total volume of interest, then under this first mode of Newman improvement the breath would be held for N heart cycles or more, so to speak, and one way or another (meaning that by one interleave or another) the subvolumes are temporally assembled in relation to a cardiosynchronizing time reference such that a complete volume is available for display in non-real time over the duration of several heart cycle, as summarized cols. 5-6 bridging. For slower moving anatomic regions the subvolumes can be assembled using interleaved frames apparently unlinked to the heart cycle as reference per Col. 6 lines 15 - 17.

2) A real-time on the fly complete imaging mode in the subvolumes are being acquired round-robin fashion in whatever the predetermined repeating sequence is and in which the currently acquired subvolume over-writes the last-acquired one. While real-time in nature, this means that if the original prior art subsector size was set as a pragmatic answer to 'what fraction $1/N$ of the total volume of interest can we continually view without flicker given the slow round-trip transit time of ultrasound through tissue?' then the second mode of Newman improvement provides an image instead of the total volume of interest but with a flicker that is roving. A rough analogy would be a spotlight that is moved back and forth between characters on a stage set...real-time but chopped/discontinuous in terms of a complete view.

In Newman a variety of embodiments which are related to different subvolume geometries are then presented.

It is important to footnote that a 'subvolume' technically can be a one-dimensional single-beam in the sense of the disparate interleave of Fig.4a-b, a two-dimensional scanplane in the sense of col. 6 lines 15 - 17 (because in either case these are true subunit increments of what comprises an image volume) , or a bona-fide subvolume in the sense of a three-dimensional wedge or strip (in the respective cases of Newman Figs. 3 and 6) or e.g. a block in the case of a cubic scanning protocol. Additionally the subvolume interleave can be non-democratic and skewed towards a central region of high interest as 510 of Fig. 5.

Either of Newman's modes can be non-realtime in the absolute sense of col. 5 mid-portion since mode 2 as defined above can be acquired at one time in one place and analyzed at another time in another place. ** see footnote below.

Savord (US5993390) in one respect may be considered to be a furtherance of Newman Figs. 6, 3. in its own respective Figs. 5 and 6, and operates in both Newman mode 1) or non-real time cardiosynchronized mode of operation after the acquisition of all volume subregions such that for example a twelve heartbeat set is completed per column 5 discussion and Newman mode 2) or real-time acquisition during such acquisition. Meaning that during the build-up of the breath-holding or 'several cycle video clip or loop' that will then represent a high resolution but not real-time Mode 1 (which latter result Savord is hedgingly saying is not completely satisfactory because it is not possible to completely eliminate gross respiratory movement artifact contaminating heart volume image buildup over the necessary severality of heart

cycles.) a real-time but low resolution Mode 2) image of sequential/non-sequential cardiac subvolumes is displayed while it is being acquired, as per col. 6 lines 27-50 which discusses these 'low' and 'high resolution' modes. [It appears what would be a flicker in the 'spotlight analogy' re Newman above is being called 'low resolution' in Savord, 'resolution' being perhaps a misnomer because scanline density determines resolution, but it would seem that both a fade in average intensity as well as intensity variation would result in the real-time technique of either patent, In the sense that a flickering lightbulb whose filament is failing presents both a darker room and a varying room brightness relative to a functioning bulb.]

Savord also offers that the subvolumes may vary in size and shape dependent upon the way in which cardiac phases are divided to correspond to their capture, per col. 4 lines 31 - 37, and that active apertures may change in support of the captures. The shape of the overall volume may differ, as in the cube/pyramidal example of the Exr's above.

The applicant's technique is by contrast directed to real-time refresh of subvolumes such that the high resolution of the prior art playback acquisition may be had with the contemporaneity of real-time subvolume refresh, in a sense the 'best of both worlds' re Newman's Modes 1) and 2) or Savord's 'high resolution/low resolution' fused together. This is expressed in the application's summary para [0051].

Whereas Newman calls an 'over-write' function where new data over-writes old during the real-time process to produce a full, larger-volume continuously updated image (col. 6 lines 58 - 63), Newman considered alone or together with Savord does not

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teach or suggest fusion of cardiosynchronized and real-time modes such that a 'realtime' ** volume image with cardiosynchronized sub-volume portions displayed concurrently with an on the fly subvolume refresh can be sustained..

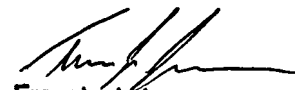
[**Since for example Lysyansky et al US6221020 (now of record) in its elements 22 - 28 represents that the actual imaging of bedside-acquired data may occur at a different time and place such as a workstation or Internet retrieval, so that real-time may be non-realtime-realtime so to speak. Therefore while this terminology is useful to understand the existing patents, 'bedside realtime' or 'patient-technician interaction realtime' is not necessarily the scenario of use, and the claims as amended are self-referenced regarding the contemporaneity of their steps and structure interactions.]

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 571-272-4738.

FJJ:fjj

9/27/07


Francis J. Jaworski
Primary Examiner